

Remarks:

Reconsideration of the application is requested.

Claims 1 and 4-7 remain in the application. Claim 1 has been amended. A marked-up version of claim 1 is attached hereto on a separate page. Claims 2 and 3 have been cancelled.

In the first paragraph on page 2 of the above-identified Office action, claims 1-7 have been rejected as being indefinite under 35 U.S.C. § 112.

More specifically, the Examiner has stated that these claims are vague and indefinite in that it is unclear what actual structure is defined by the term "etching structures". The Examiner further stated that it is noted that the term is used in the original disclosure, but no explanation or description is given. As stated in the amendment dated November 20, 2003 the specification provides explanation of the "etching structures" in several locations of the specification, as previously noted. Nevertheless, claim 1 has been amended so as to facilitate prosecution of the application. Therefore, the rejection is now moot.

It is accordingly believed that the specification and the claims meet the requirements of 35 U.S.C. § 112, first and

second paragraphs. Should the Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved. The above-noted changes to the claims are provided solely for cosmetic or clarificatory reasons. The changes are not provided for overcoming the prior art nor for any reason related to the statutory requirements for a patent.

In the third paragraph on page 2 of the Office action, claim 1 has been rejected as being fully anticipated by Bottom (U.S. Patent No. 4,130,771) under 35 U.S.C. § 102.

The rejection has been noted and the claims have been amended in an effort to even more clearly define the invention of the instant application. The claims are patentable for the reasons set forth below. Support for the changes is found in claims 2 and 3 of the instant application.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, *inter alia*:

an additional layer disposed on said upper electrode layer, the additional layer being structured with etching structures selected from the group consisting of holes and islands spaced

at less than a wavelength of an operating wavelength of the resonator, for setting a prescribed resonant frequency of the piezoelectric resonator.

The Bottom reference discloses tuning an aluminum-plated resonator by anodically oxidizing an aluminum layer onto the resonator. The aluminum layer is manufactured to such a thickness that the resonant frequency of the resonator is somewhat above the nominal frequency. Then the aluminum layer is anodically oxidized whereby the surface of the aluminum layer is transformed into a layer of aluminum oxide, thereby increasing the mass of the electrode layer and therefore lowering the resonant frequency of the resonator to the desired level. Therefore, Bottom teaches the tuning of a resonator by adding mass to an electrode layer.

The reference does not show an additional layer disposed on said upper electrode layer, the additional layer being structured with etching structures selected from the group consisting of holes and islands spaced at less than a wavelength of an operating wavelength of the resonator, for setting a prescribed resonant frequency of the piezoelectric resonator, as recited in claim 1 of the instant application. The Bottom reference does not disclose that structures in the form of holes or islands are to be formed in an additional layer on top of the electrode layer.

Also in the third paragraph on page 2 of the Office action, claim 1 has been rejected as being fully anticipated by Zimnicki et al. (U.S. Patent No. 6,249,074 B1) under 35 U.S.C. § 102.

The Zimnicki et al. reference teaches to tune a resonator by ablating some of the material of a sacrificial layer (16) disposed on top of an electrode layer by the use of ion milling desputtering.

The reference does not show an additional layer disposed on said upper electrode layer, the additional layer being structured with etching structures selected from the group consisting of holes and islands spaced at less than a wavelength of an operating wavelength of the resonator, for setting a prescribed resonant frequency of the piezoelectric resonator, as recited in claim 1 of the instant application. The Zimnicki et al. reference does not disclose etching structures made of either holes or islands. The Zimnicki et al. reference is limited to the approach of reducing the mass of the sacrificial layer (16) by thinning the layer, as can be seen in Figs. 6 and 7 of the reference. This is contrary to the invention of the instant application as claimed, in which an additional layer is structured with etching structures in the form of holes or islands.

In the sixth paragraph on page 2 of the Office action, claims 2-7 have been rejected as being obvious over Bottom (U.S. Patent No. 4,130,771) in view of Von Dach (U.S. Patent No. 4,562,370), Fujita et al. (U.S. Patent No. 4,638,205), or Arvanitis (U.S. Patent No. 4,642,505) under 35 U.S.C. § 103.

In one of the embodiments of the present invention the etching structures are holes. The effect of etching the holes in the additional layer is that "the perforation of the additional layer is fuzzy for the acoustic wave and therefore does not scatter the wave; the perforation acts on the wave as a change in the mean density". Therefore, the resonant frequency of the resonator can be adjusted by way of the structured additional layer without the problem of having to manufacture an additional tuning layer within very narrow manufacturing tolerances, in order to achieve the desired tuning effect. By structuring the additional layer, the tuning of the piezoelectric resonator can be achieved with high accuracy by using a simple lithographic process. A further beneficial effect achieved is that higher modes of the perforator are scattered at the structures, thereby reducing the undesired influences of these modes on the filter characteristics.

The Bottom reference discloses a fine-tuning step by constantly adding mass to the electrode until a certain

frequency is achieved. This method reaches the desired frequency arriving from higher frequencies by reducing the frequency (as the weight is constantly increased). Each of the Von Dach, Arvanitis and Fujita et al. references contradict the Bottom reference by disclosing different techniques of ablating mass. These methods approach the desired nominal frequency arriving from lower frequencies by increasing the frequency (the weight is reduced). Therefore, no person of ordinary skill in the art would combine the teachings of the above-noted references, as the effort to do so would needlessly be twice as great as choosing only one method.

Furthermore, regarding the Arvanitis reference, it is noted that Arvanitis discloses tuning the resonant frequency in a monolithic crystal filter. This is contrary to the present invention, in which a thin film resonator is tuned.

Furthermore, Arvanitis discloses tuning the filter by forming a contiguous area by laser trimming directly in the electrode and not in an additional layer disposed on the upper electrode layer.

A critical step in analyzing the patentability of claims pursuant to 35 U.S.C. § 103 is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and

the then-accepted wisdom in the field. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614,1617 (Fed. Cir. 1999). Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Most if not all inventions arise from a combination of old elements. See In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453,1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See id. However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See id. Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the appellant. See In re Dance, 160 F.3d 1339, 1343, 48 USPQ2d 163.5, 1637 (Fed. Cir. 1998); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125,1127 (Fed. Cir. 1984).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein). Whether the examiner relies on an express or an implicit showing, the examiner must provide particular findings related thereto. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. Broad conclusory statements standing alone are not "evidence." Id. When an examiner relies on general knowledge to negate patentability, that knowledge must be articulated and placed on the record. See In re Lee, 277 F.3d 1338, 1342-45, 61 USPQ2d 1430, 1433-35 (Fed. Cir. 2002).

Upon evaluation of the examiner's response, it is respectfully believed that the evidence adduced by the examiner is insufficient to establish a prima facie case of obviousness

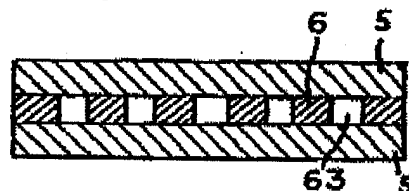


with respect to the claims. Accordingly, the examiner is requested to withdraw the rejection.

Also in the sixth paragraph on page 2 of the Office action, claims 2-7 have been rejected as being obvious over Zimnicki et al. (U.S. Patent No. 6,249,074 B1) in view of Von Dach (U.S. Patent No. 4,562,370), Fujita et al. (U.S. Patent No. 4,638,205), or Arvanitis (U.S. Patent No. 4,642,505) under 35 U.S.C. § 103.

With regard to the Von Dach reference, it is noted that Von Dach discloses a method for adjusting the frequency of a piezoelectric crystal resonator of the tuning fork type (column 2, lines 31-35). The metal coating (12), which partially covers the crystal, is pierced by shots of a laser beam to adjust the frequency of the crystal resonator (column 1, lines 44-56; column 2, line 63 to column 3, line 4). The spot size is roughly 0.5 mil, which reflects the minimum spot size of a laser. Due to the size of the laser spot, laser trimming cannot be used to form a structure as disclosed in the present invention. Furthermore, the Von Dach reference does not disclose an additional layer disposed on an electrode. Therefore, the combination of Bottom and Von Dach does not obviate the invention of the instant application.

Regarding the Fujita et al. reference it is noted that, Fujita et al. disclose a piezoelectric transducer used as a buzzer, whose operational frequency is about 3.1 kHz. This type of transducer is not a thin film resonator. The 70  $\mu$ m thick piezoelectric ceramic sheet (5) is directly bonded to a vibrating reed (6) (Fig. 10). The electrode (4) covers the reed. The reed is not disposed on this electrode. Fujita et al. is not relevant prior art since the differences between a buzzer and a thin film resonator are considerable.

**FIG. 10**

Furthermore, as stated above regarding the Arvanitis reference it is noted that Arvanitis discloses tuning the resonant frequency in a monolithic crystal filter. This is contrary to the present invention, in which a thin film resonator is tuned. Furthermore, Arvanitis discloses tuning the filter by forming a contiguous area by laser trimming directly in the electrode and not in an additional layer disposed on the upper electrode layer.

Furthermore, it is the desire of Arvanitis to avoid any pattern and to cut off a "contiguous area" (24). Arvanitis goes so far as to list advantages of removing a "contiguous area" over the "spot pattern" technique of the prior art (column 5, line 54 to column 6, line 11). This is in contrast to the invention of the instant application, which teaches that an additional layer is provided on the upper electrode with etching structures in the form of holes or islands in order to set the frequency of the resonator. Therefore, Arvanitis teaches away from the present invention.

As stated above with regard to the rejections over Bottom, upon evaluation of the examiner's response, it is respectfully believed that the evidence adduced by the examiner is insufficient to establish a prima facie case of obviousness with respect to the claims. Accordingly, the examiner is requested to withdraw the rejection.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Claim 1 is, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.


In view of the foregoing, reconsideration and allowance of claims 1 and 4-7 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel respectfully requests a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made.

Please charge any other fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner & Greenberg P.A., No. 12-1099.

Respectfully submitted,

  
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Marked-up version of the claims:

Claim 1 (amended). A thin film piezoelectric resonator,  
comprising:

a lower electrode layer and an upper electrode layer;

a piezoelectric layer between said lower electrode layer and  
said upper electrode layer;

an additional layer disposed on said upper electrode layer,  
said additional layer being structured with etching structures  
selected from the group consisting of holes and islands spaced  
at less than a wavelength of an operating wavelength of the  
resonator, for setting a prescribed resonant frequency of the  
piezoelectric resonator.